DETAILED ACTION

Response to Amendment

The amendment filed 01/27/2011 has been entered and made of record. Claims 4, 19, 46-47 and 49-50 are cancelled. Claims 1-3, 5-18, 20-45 and 48 are pending.

The amendments made to claims 1, 4, 7, 15, 19, 35, 41 and 44 have overcome the 35 USC §112(2) rejection made in the Non-Final office action filed 08/27/2010.

The amendments to claims 1-18, 20-29, 32-40, 45 and 48 has overcome the 35 USC §101 rejection made in the Non-Final office action filed 08/27/2010.

Response to Arguments

Applicant's arguments with respect to claims 1-50 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **2**, **22**, **32**, **36** and **37** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim **2** recites the limitation "*the* density of a nodal mesh density between said start point and said end point" and "*the* density of a nodal mesh prior to the selection of a start point and an end point" in line 3. There is insufficient antecedent basis for this

limitation in the claim. Additionally, it is unclear if “the selection of a start point and an end point for said path" are the same as said start point and said end point defined in claim 1.

Claim **22** recites the limitation "the location" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim **32** recites the limitation "the vicinity" in line 8. There is insufficient antecedent basis for this limitation in the claim.

Claim **36** recites the limitation "the content" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim **37** recites the limitation "the content creation" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claims **11-13** and **26-28** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 11 and 26 recite step (b) of claims 1 and 18 respectively, is performed *prior* to receiving an indication. However Claims 10 and 25 recite from which claims 11 and 26 respectively depend from, recites performing step (b) *after* receiving an indication. Therefore it is unclear how step (b) can be performed *prior* to receiving an indication if step (b) is initially performed *after* receiving an indication. Due to the severity of this 35 USC §112(2) rejection, no prior art can be given to claims 11-13 and 26-28.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims **30-31**, **41-44** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 18-31, 35, 41-44 recites a system that solely calculates an algorithm. This is not directed to the type of subject matter eligible for patent protection. One may not patent a process that comprises every "substantial practical application" of an abstract idea, because such a patent "in practical effect would be a patent on the [abstract idea] itself." Benson, 409 at 71-72, 175 USPQ at 676; cf. Diehr, 450 U.S. at 187, 209 USPQ at 8. Although the claims' preamble states an apparatus (it *does* claim an invention within one of the statutory classes), the limitations of the claim are directed to an abstract idea, i.e., it is in reality seeking patent protection of the instructions, therefore claiming an invention that falls/covers/includes a judicial exception. Specifically, the bodies of the claims recite a "means" for performing the steps. The claims fail to recite hardware implementing the process, such as a processor. Furthermore, Applicant's disclosure states that the steps are handled by instructions stored on e.g., a computer readable medium executed by a processor [pg. 6]. Therefore, one could conclude the "means" claimed are computer programs *per se*. Ergo, there is no practice application by physical transform, i.e., the "program". The claim is in fact reciting limitations of the instructions/program and not limitations of the apparatus to produce a result.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim **16** and **30**, rejected under 35 U.S.C. 102(b) as being anticipated by Lester ("A*Pathfinding for Beginners").

In regards to claim **16**, Lester teaches A*Pathfinding algorithm. As shown in Fig. 1, point A and point B are defined as starting and destination point, respectively [pg.1]. The shortest path is determined by initially checking the adjacent squares surrounding the starting point, and then generally searching outward until the destination point is found [pg.2]. The cost to move from the starting point A to a given square on the grid, following the path generated to get there (G) is determined. Lester further teaches estimating the movement cost to move from that given square on the grid to the final destination, point B (H) [pg. 2]. When beginning at starting point A, point A will be added to an "open list" of squares that can be considered. The "open list" (said ***regions of influence***) contains squares that might fall along the path you want to take or not. Each square in the "open list" has an F score (said ***interest values***) that is based on F = G+H. The next square that is chosen is the square with the lowest F score (said ***calculating path takes into consideration the interest values***) [pg. 2].

In regards to claim **30**, claim 30 recites similar limitations as claim 16 but in system form. Therefore the rationale of claim 16 is incorporated herein. Furthermore, method disclosed by Lester is for programming a computer. Therefore storage and processing means would have been included.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims **1**, **3**, **10**, **14-15**, **18**, **25**, **29**, **32-45** and **48** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lester (“A*Pathfinding for Beginners”) in view of Pinter ("Gamasutra").

In regards to claims **1**, **18**, **45**, and **48**, Lester teaches A*Pathfinding algorithm. As shown in Fig. 1, point A and point B are defined as ***starting*** and ***destination point***, respectively [pg.1]. The shortest path is determined by initially checking the adjacent squares (said ***new point located on line of sight***) surrounding the starting point, and then generally searching outward until the destination point is found [pg.2]. The adjacent square with the lowest F score is chosen (referred to as square 2). Then, the adjacent squares surrounding square 2 are now considered (said ***calculating the path based on any combination of new and/or initially defined points***) and the adjacent

square with the lowest F score is chosen (referred to as square 3). This continues until the destination point is found (said ***dynamically redefining the topology by generating a plurality of additional points***) [pg.4-6].

Lester fails to explicitly teach defining a new point located on a midpoint of a line of sight link between two existing points. However, Pinter teaches a modification to the A* algorithm where the path is subdivided. Furthermore, the line is subdivided into midpoints (said ***new point located on a midpoint***), each of which is then used as a subdestination [pg.3]. When the midpoint is found, each point on the matrix stores the cost to get to the point, total cost through that point to the goal, the location of it's parent tile, a Boolean stating whether it's on the "Open" list of actively pursued nodes, and the locations of the Previous and Next nodes in the Open list [pg.3].

It would have been obvious to one of ordinary skill in the art to modify the system/method of Lester with the modified version of A*Pathfinding of Pinter the modified A*Pathfinding of Pinter avoids all memory allocation and list insertions, resulting in a dramatically faster algorithm [Pinter: pg.4].

In regards to claim **3**, Lester teaches the limitations of claim 3 with the exception of explicitly teaching the virtual environment represents a virtual world. However, Pinter teaches the modified A*Pathfinding algorithm for a game situation (said ***virtual world***) [pg.1].

In regards to claims **10** and **25**, Lester teaches A*Pathfinding algorithm. As shown in Fig. 1, point A and point B are defined (said ***receiving an indication from a user that they desire a path to be calculated***)as starting and destination point, respectively [pg.1]. The shortest path is determined by initially checking the adjacent squares surrounding the starting point, and then generally searching outward until the destination point is found [pg.2]. The adjacent square with the lowest F score is chosen (referred to as square 2). Then, the adjacent squares surrounding square 2 are now considered and the adjacent square with the lowest F score is chosen (referred to as square 3). This continues until the destination point is found [pg.4-6]. As modified by Pinter, Pinter teaches a modification to the A* algorithm where the path is subdivided. Furthermore, the line is subdivided into midpoints, each of which is then used as a subdestination [pg.3]. Therefore, combined, the method/system of Lester in view of Pinter calculates the desired path after the user has defined the starting point and ending point (said ***step (b) occurs after said indication***). The same rationale to combine as taught in claim 1 is provided herein.

In regards to claims **14** and **29**, Lester teaches determining the cost to move from the starting point A to a given square on the grid, following the path generated to get there (G). Lester further teaches estimating the movement cost to move from that given square on the grid to the final destination, point B (H) [pg. 2]. When beginning at starting point A, point A will be added to an "open list" of squares that can be considered. The "open list" (said ***regions of influence***) contains squares that might fall

along the path you want to take or not. Each square in the "open list" has an F score (said ***interest values***) that is based on F = G+H. The next square that is chosen is the square with the lowest F score (said ***calculating path takes into consideration the interest values***) [pg. 2].

In regards to claim **15**, Lester teaches the "open list" (said ***regions of influence***) contains squares that might fall along the path you want to take or not. Each square in the "open list" has an F score (said ***interest values***) that is based on F = G+H. The next square that is chosen is the square with the lowest F score (said ***calculating path takes into consideration the interest values***) [pg. 2]. Furthermore, the goal of choosing the next square is to choose the route that will result in the shortest path (said ***Euclidean distance***). Therefore, choosing the adjacent square within the "open list" with the smallest F score results is inversely dependent on the distance, i.e., shortest path, from the current point to the next adjacent point (said ***region of influence***).

In regards to claim **32**, **39**, **41**, Lester teaches A*Pathfinding algorithm. As shown in Fig. 1, point A and point B are defined as ***starting*** and ***destination point***, respectively [pg.1]. The shortest path is determined by initially checking the adjacent squares surrounding the starting point (said ***redefining in vicinity of start/end point***), and then generally searching outward until the destination point is found (said ***plurality of additional points generated***) [pg.2]. The cost to move from the starting point A to a given square on the grid, following the path generated to get there (G) is determined.

Lester further teaches estimating the movement cost to move from that given square on the grid to the final destination, point B (H) [pg. 2]. When beginning at starting point A, point A will be added to an "open list" of squares that can be considered. The "open list" contains squares that might fall along the path you want to take or not. Each square in the "open list" has an F score that is based on F = G+H. The next square that is chosen is the square with the lowest F score [pg. 2]. Thus, the adjacent square with the lowest F score is chosen (referred to as square 2). Then, the adjacent squares surrounding square 2 are now considered (said ***calculating the path based on any combination of new and/or initially defined points***) and the adjacent square with the lowest F score is chosen (referred to as square 3). This continues until the destination point is found (said ***dynamically redefining the topology by generating a plurality of additional points***) [pg.4-6]. Since the determination of the next point is based on the adjacent squares, the ***angle of deviation is constrained*** to either 0, $\pm$ 45º, $\pm$ 90º since the next point in the path is chosen from an adjacent square.

Lester fails to explicitly teach defining a new point located between two existing points. However, Pinter teaches a modification to the A* algorithm where the path is subdivided. Furthermore, the line is subdivided into midpoints (said ***new point located between two existing points***), each of which is then used as a subdestination [pg.3]. When the midpoint is found, each point on the matrix stores the cost to get to the point, total cost through that point to the goal, the location of it's parent tile, a Boolean stating whether it's on the "Open" list of actively pursued nodes, and the locations of the Previous and Next nodes in the Open list [pg.3].

It would have been obvious to one of ordinary skill in the art to modify the system/method of Lester with the modified version of A*Pathfinding of Pinter the modified A*Pathfinding of Pinter avoids all memory allocation and list insertions, resulting in a dramatically faster algorithm [Pinter: pg.4].

In regards to claim **33**, Lester teaches the cost to move from the starting point A to a given square on the grid, following the path generated to get there (G) is determined. Lester further teaches estimating the movement cost to move from that given square on the grid to the final destination, point B (H) [pg. 2]. When beginning at starting point A, point A will be added to an "open list" of squares that can be considered. The "open list" contains squares that might fall along the path you want to take or not. Each square in the "open list" has an F score that is based on F = G+H. The next square that is chosen is the square with the lowest F score [pg. 2]. Since the determination of the next point is based on the adjacent squares, the angle of deviation is constrained to either 0, ± 45º, ± 90º (said ***varying angle of deviation cost***) since the next point in the path is chosen from an adjacent square. Furthermore, the F score can further include the ***varying angle of deviation cost*** since the adjacent square selected will be the square with the lowest F score.

In regards to claim **34**, Lester teaches the next point on the path is selected from an adjacent square that will be either 0, ± 45º, ± 90º (said ***predetermined range***) [pg.2].

In regards to claim **35**, Lester teaches the next point on the path is selected from an adjacent square that will be either 0, $\pm$ 45º, $\pm$ 90º (said ***predetermined range***) [pg.2]. Thus the new point is selected as being adjacent to the first point (said ***angle determined as a function of new point from first point***).

In regards to claim **36**, Lester teaches A*Pathfinding algorithm for programming paths within a game (said ***content***).

In regards to claim **37**, Lester teaches obstacles (said ***content creation***) within the area of determining the path [pg.1-4]. The method/system of Lester puts adjacent squares that are obstacles on a "closed list" so that the method/system does not consider that path (said ***determine path after content creation***) [pg.2-4].

In regards to claim **38**, Lester teaches using A*Pathfinding algorithm for determining a path. Pinter further teaches a modified version of A*Pathfinding for a gaming environment. The method/system of Pinter permits realistic turns to a destination [pg. 6]. Although Pinter does not explicitly teach the destination point dynamically changing, it would have been obvious to one of ordinary skill in the art that the gaming environment of Lester permits the user to modify their path as needed, therefore changing their destination.

In regards to claim **40**, Lester in view of Pinter teaches turns [Pinter: pg.6] along the path. Pinter further teaches calculating the length of the path [Pinter: Fig.6; pg. 7]. Additionally, the A*Algorithm of Pinter teaches determining the speed of movement on the path based on the type of path (e.g., sand vs. pavement) as well as take into account the amount of turning needed (said ***navigation determined as function of degree of curvature***) and distance of the path [Pinter: pg.19]..

In regards to claim **42**, Lester in view of Pinter teaches implementing the A*Algorithm within a gaming environment. It would have been obvious to one of ordinary skill in the art to for the user to be navigated automatically through the defined path in order for characters, animals, and vehicles of the game to move in some goal-directed manner [Lester pg. 1].

In regards to claim **43**, Lester in view of Pinter teaches favoring angles that point toward the goal, while also taking turning radius into account. Therefore, Pinter teaches changing the heuristic (said ***selecting rate***) to be the distance of the shortest curve from the current location and angle to the destination location (said ***curvature of path varies as a function of position***) [Pinter: pg.12].

In regards to claim **44**, claim 44 recites similar limitations as claims 41 and 43. Therefore the rationale of claims 41 and 43 is incorporated herein.

2. Claims **2**, **5-9** and **20-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lester ("A*Pathfinding for Beginners") in view of Pinter ("Gamasutra") as applied to claim 1 and in further view of Stevens (6,862,727).

In regards to claim **2**, Lester in view of Pinter teaches the limitations of claim 2 with the exception of explicitly teaching redefining the topology of the virtual environment by increasing the density of a nodal mesh density between said start and end point compared to the destination prior to the selection of the start and end point. However, Stevens teaches adding a node between adjacent node pairs (said ***increasing density of nodal mesh***) that are separated by more than a threshold distance (120) [c.12 L.42-55]. The addition of nodes happens after the start and end points are determined. Therefore the nodal mesh after start and end point are established is greater than the nodal mesh prior to the start and end point being established.

It would have been obvious to one of ordinary skill in the art to modify the method/system of Lester in view of Pinter with the path definition of Stevens because this would attempt to make the node pattern more uniform [Stevens: c.12 L.19-27].

In regards to claims **5** and **20**, Lester in view of Pinter teaches the limitations of claims 5 and 20 with the exception of disclosing deleting the new point if it is less than a predefined distance from another of the points. However, Stevens teaches a system/method for determining a trace (said ***path***) between nodes. When defining the path, a way to adjust the nodes in an attempt to make the node pattern in a trace more

uniform is to remove nodes that are spaced closer than a threshold distance (said ***deleting the new point if it is less than a predefined distance from another point***) [c.12 L.56-60].

It would have been obvious to one of ordinary skill in the art to modify the method/system of Lester in view of Pinter with the path definition of Stevens because this would attempt to make the node pattern more uniform. Using a smaller threshold provides more precise results [Stevens: c.12 L.19-27].

In regards to claims **6** and **21**, in combination with the rationale of claims 5 and 20, Stevens teaches the routing space (said ***virtual environment***) may be divided into a plurality of areas in which a particular set of design rules and/or other parameters (said ***predefine distance***) apply in one area of the routing space and a different set of design rules and/or other parameters apply in another area of the routing space (said ***varies in different regions***) [c.14 L.15-20]. The same motivation provided in claims 5 and 20 is incorporated herein.

In regards to claim **7** and **22**, Lester in view of Pinter teaches the limitations of claims 7 and 22 with the exception of disclosing identifying a link as not being suitable for providing a location for a new point if said link intersects another one of said links which is shorter. However, Stevens teaches not adding a new node (said ***identifying a link***) if the distance between adjacent nodes (e.g., 1114 and 1116) is less than the threshold (1120) (said ***link intersects link which is shorter***) [c.12 L.40-35; Figs. 11A-D].

It would have been obvious to one of ordinary skill in the art to modify the method/system of Lester in view of Pinter with the path definition of Stevens because this would attempt to make the node pattern more uniform [Stevens: c.12 L.19-27].

In regards to claims **8** and **23**, Lester in view of Pinter teaches the limitations of claims 8 and 23 with the exception of explicitly disclosing deleting a new point if it does not have a line of sight to each pair of points. However, Stevens teaches a design rule violation occurs (e.g.) if node (914) is closer to obstacle (940) than the minimum obstacle-to-trace-clearance [c.13 L.31-33]. Thus if node (914) is too close to obstacle (940), the line of sight between the end nodes will be obstructed due to the obstacle (said ***does not have line of sight***). As Stevens further teaches, nodes that are spaced closer than a threshold distance (said ***deleting the new point***) are removed [c.12 L.56-60]. Therefore, the distance from node (914) to obstacle (940) would be spaced closer than a threshold distance; violating a design rule.

It would have been obvious to one of ordinary skill in the art to modify the method/system of Lester in view of Pinter with the path definition of Stevens because this would attempt to make the node pattern more uniform [Stevens: c.12 L.19-27].

In regards to claims **9** and **24**, Lester in view of Pinter teaches the limitations of claims 9 and 24 with the exception of disclosing deleting the new point if does not form part of a path between two other nodes that is shorter than the shortest path which would exist between said two points without said new point. However, Stevens teaches a

system/method for determining a trace (said ***path***) between nodes. When defining the path, a way to adjust the nodes in an attempt to make the node pattern in a trace more uniform is to remove nodes (said ***deleting new point***) that are spaced closer than a threshold distance (said ***shortest path***) [c.12 L.56-60]. Therefore, when a new node is added, if the new node is closer than a threshold distance, it is deleted.

It would have been obvious to one of ordinary skill in the art to modify the method/system of Lester in view of Pinter with the path definition of Stevens because this would attempt to make the node pattern more uniform. Using a smaller threshold provides more precise results [Stevens: c.12 L.19-27].

3. Claim **17** and **31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lester ("A*Pathfinding for Beginners") in view of St.Julien et al. ("Firefighter Command Training Virtual Environment").

In regards to claims **17** and **31**, Lester teaches determining the cost to move from the starting point A to a given square on the grid, following the path generated to get there (G). Lester further teaches estimating the movement cost to move from that given square on the grid to the final destination, point B (H) [pg. 2]. When beginning at starting point A, point A will be added to an "open list" of squares that can be considered. The "open list" (said ***regions of influence***) contains squares that might fall along the path you want to take or not. Each square in the "open list" has an F score (said ***interest values***) that is based on F = G+H. The next square that is chosen is the

square with the lowest F score (said ***calculating path takes into consideration the interest values***) [pg. 2].

Lester teaches the limitations of claims 17 and 31 with the exception of explicitly teaching a virtual entity travelling through a virtual world. However, St.Julien teaches a firefighter training virtual environment where the virtual environment provides a variety of firefighting scenarios as shown in Figs. 1 and 2 (said ***virtual world***). The animation of the virtual environment contains absolute position changes and relative rotation changes for each key frame of the firefighter (said ***field of view parameter in respect to travelling***). The animation parser uses these values to create the animations seen in the virtual environment. The parser interpolates the transformations of each object over time and makes the appropriate small change to the object every frame [pg.31-32]. Since the field of view is based on the user's current path, the field of view parameter would rely on the A*Algorithm of Lester where the path is determined based on the “open list” (said ***regions of influence; field of view calculated on region of influence***). It would have been obvious to modify the method/system of Lester to use the path finding system in a virtual world because St.Julien teaches using the A*path finding algorithm to plan the path for the firefighters [pg.31].

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Fukushima et al. (5,991,688)

Stevens et al. (6,678,876)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle K. Lay whose telephone number is (571) 272-7661. The examiner can normally be reached on Monday-Friday 8:30p-4:30p with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee M. Tung can be reached on (571) 272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michelle K. Lay/
Primary Examiner, Art Unit 2628
8 April 2011